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Report to Congressional Committees

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December 1991

B-2 BOMBER

Logistics Cost Issues and Construction Planning



92-28790



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National Security and
International Affairs Division

DTIC QUALITY ASSURED

B-246013

December 11, 1991

The Honorable Sam Nunn
Chairman, Committee on Armed Services
United States Senate

The Honorable Daniel K. Inouye
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Les Aspin
Chairman, Committee on Armed Services
House of Representatives

The Honorable John P. Murtha
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

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As part of our continuing review of the B-2 program, this report addresses the estimated logistics costs for the B-2 bomber and the planning for construction of B-2 facilities. This report compares estimates of logistics costs for the original 132 aircraft program and for the Air Force's current plan to acquire 75 aircraft. Although recent congressional actions on the fiscal year 1992 Defense Authorization Act did not fully approve the Air Force's request for the B-2, the Air Force is still planning to acquire 75 operational aircraft. Therefore, this report is still pertinent.

Background

The B-2 is one of the most costly Department of Defense (DOD) acquisition programs, and it continues to be a central issue in the debate over future defense needs. It is being developed by the Air Force to be capable of attacking well-defended targets at close ranges during conventional or nuclear wars. The B-2 uses low observable technologies involving control of radar, infrared, optical, electromagnetic, and acoustical signatures to reduce an adversary's ability to detect, locate, track, and shoot at it. For the most part, B-2 logistics—facilities, support equipment, personnel, and spare parts—are required to be available and/or ready for operation when aircraft are delivered to the Strategic Air Command. The first operational B-2s are to be located at Whiteman Air Force Base, Missouri.

In April 1990, the Secretary of Defense revised the B-2 procurement program, decreasing the number of operational aircraft from 132 to 75 and delaying aircraft procurement and delivery dates. Logistics cost estimates provided by the Air Force were compiled, extended, and escalated by us using DOD prescribed escalation rates. These estimates indicate that logistics costs for 75 aircraft would total about \$28 billion over 20 years.¹ Estimated logistics costs for 132 aircraft were \$45 billion.

Results in Brief

The cost to logistically support the B-2 depends on the reliability of its subsystems, components, and parts. A history of reliability problems on other weapon systems, however, indicates that the Air Force's reliability predictions and, therefore, its estimates of logistics costs for the B-2 may be optimistic. Undefined maintenance processes for low observable technologies, increased emphasis on using the B-2 in a conventional role, and the continuing need to change the design of the aircraft and its components also indicate that the Air Force may have difficulty achieving its estimates of logistics costs for a 75-aircraft program.

The Air Force has had difficulty synchronizing construction projects with changing aircraft delivery dates. Because the Air Force had limited flexibility to adjust its approved military construction plans when program delays occurred, several construction projects at Whiteman Air Force Base were completed at least 3 to 4 years before required. The personnel system can be adjusted more quickly to revised aircraft delivery dates than can construction projects. Air Force planners made substantial changes to personnel assignments that precluded the premature assignment of personnel to Whiteman Air Force Base.

B-2 Logistics May Be More Costly Than the Air Force Estimates

The Air Force's estimates indicate that the logistics costs for 75 B-2s will be about \$28 billion over the first 20 years. If the Air Force's reliability predictions are not achieved, increased quantities of spares, additional test equipment, and a need for more highly trained personnel could cause overall B-2 logistics costs to be higher than the Air Force expects.

The cost to support a weapon system like the B-2 depends on the reliability of its subsystems, components, and parts. Reliable systems require fewer repairs and lower maintenance than less reliable systems. Other aircraft programs have had problems meeting reliability predictions. For

¹This amount includes \$2.6 billion for initial spare parts and \$1.1 billion for construction, which are also considered as acquisition costs in the B-2 acquisition cost estimate of \$64.8 billion.

example, during the first 3 years of operation, the F-117A experienced low reliability rates and required large amounts of maintenance time, especially on its low observable features. The logistics costs of the program increased significantly from initial estimates. Also, the B-1B had reliability problems with parts that increased costs. The estimated cost for contractors to repair parts increased from a 1981 estimate of \$250 million to a 1988 estimate of \$570 million.

Logistics costs could also exceed estimates if precise maintenance of the B-2's low observable characteristics is required. The Air Force predicts that B-2 maintenance, which involves low observable technologies, will be lower than B-52H and B-1B aircraft maintenance, which involves little or no low observable technologies. However, the Air Force has not yet defined its maintenance processes for low observable technologies involving the B-2's outer surfaces.

Further, design changes will be required to meet B-2 performance requirements and reliability predictions, which could result in multiple configurations of parts, revised logistics plans, and higher costs. For example, when the B-2 encountered cracking in the rear deck during flight testing, the Air Force had to develop repair procedures it had not anticipated. As of September 1991 the Air Force had identified 8,259 B-2 design changes. The Air Force does not know how many B-2 design changes will be required. The B-1B required over 200,000 design changes by the time all production aircraft were delivered.

Other factors could also cause costs to exceed estimates. For example, recent Air Force statements indicate the Air Force plans for the B-2 bomber to have a significant conventional role earlier than anticipated. Such a role will require more training, flying hours, and support equipment. The costs associated with the conventional role, however, were not considered in the Air Force's estimates of logistics cost.

Difficulty Synchronizing Construction Projects With a Changing B-2 Program

Military construction projects at Whiteman Air Force Base totaled \$89 million in fiscal year 1988 and \$60 million in fiscal year 1989. Construction of fiscal year 1988 projects began in February 1988 and was based on plans that became outdated when the aircraft delivery schedules were changed. The Air Force updated its construction plans as delivery schedules were changed; however, it could not always prevent premature construction. Consequently, in some cases, construction occurred 3 to 4 years before required and resulted in facilities, such as the combat crew training squadron and the field training detachment,

not being used or being used only on a limited basis. In addition, \$500,000 of B-2 construction funds was spent for an engine test facility that is no longer needed for the B-2 because the Air Force later decided not to do B-2 engine repairs at the operating base. According to the Air Force, the engine test facility can be used for A-10 engine testing and T-38 maintenance.

Air Force managers responded to delivery schedule changes by adjusting personnel assignment plans. For example, the original staffing plan was revised to reduce the number of B-2 personnel at Whiteman Air Force Base from 1,248 to 136 personnel in fiscal year 1991. Thus, the Air Force tried to ensure that personnel levels were based on current needs.

Scope and Methodology

To accomplish our objectives, we reviewed documents and interviewed officials at the B-2 Systems Program Office, Wright-Patterson Air Force Base, Ohio; the Oklahoma City Air Logistics Center, Tinker Air Force Base, Oklahoma; the Strategic Air Command, Offutt Air Force Base, Nebraska; the first operational base, Whiteman Air Force Base, Missouri; the U.S. Army Corps of Engineers, Omaha, Nebraska; and the Departments of Defense and the Air Force, Washington, D. C. We performed our review from August 1990 to September 1991 in accordance with generally accepted government auditing standards.

In commenting on a draft of this report, the Department of Defense concurred with some of our conclusions but disagreed that B-2 logistics may be more costly than the Air Force estimates and that B-2 facilities construction was based upon outdated plans. (See app. I for a copy of the Department's comments and our evaluation.)

We are sending copies of this report to the Secretaries of Defense and the Air Force; the Director, Office of Management and Budget; and other interested parties.

Please contact me at (202) 275-4268 if you or your staff have any questions concerning this report. Other major contributors to this report are Robert D. Murphy, Assistant Director, and Roger L. Tomlinson,

Evaluator-in-Charge, Gary L. Nelson, Evaluator, and Robert W. Jones,
Evaluator, Kansas City Regional Office.

Nancy R. Kingsbury

Nancy R. Kingsbury
Director
Air Force Issues

Comments from the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

WASHINGTON, DC 20301-3010

23 SEP 1991

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report executive summary entitled "B-2 BOMBER: Operations and Maintenance Cost Issues and Construction Planning Problems," dated August 7, 1991 (GAO Code 392561/OSD Case 8800). While concurring with some of the report conclusions, the DOD disagrees with others and does not agree with the report recommendation.

Based on historical evidence, the GAO concluded that the B-2 operations and maintenance costs may exceed Air Force estimates. It should be recognized, however, that the problems in the B-2 Full-Scale Development phase identified by the GAO are being addressed. The Air Force is aggressively pursuing solutions to these problems as part of its ongoing efforts to reduce overall program costs.

The GAO observations on planning adjustments for military construction projects for the B-2 contained factual errors and misinterpretations of data concerning construction replanning flexibility and the rationale for certain Air Force decisions on facilities construction. Furthermore, the Executive Summary of the GAO report incorrectly concludes that money was wasted on a B-2 engine test facility.

Actually, the engine test facility was fully supported by planning at the time it was constructed. When B-2 plans later changed, the Air Force acted to identify valid uses for the facility. The GAO recommendation for the Secretary of the Air Force to revise procedures for logistics and construction plans does not recognize congressional constraints that govern military construction programs. Those constraints limit the Air Force flexibility to adjust construction in line with associated program changes. The Air Force made appropriate decisions, within the constraints imposed on military construction projects, to minimize the economic penalties caused by changes in the B-2 procurement schedule.

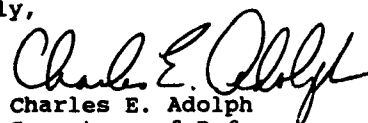
See comment 1.

See comment 2.

Appendix I
Comments from the Department of Defense

Detailed DoD comments on the report findings and recommendation are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Sincerely,



Charles E. Adolph
By Direction of the Secretary of Defense

GAO DRAFT REPORT SUMMARY - DATED AUGUST 7, 1991
(GAO CODE 392561) OSD CASE 8800

"B-2 BOMBER: OPERATIONS AND MAINTENANCE COST ISSUES
AND CONSTRUCTION PLANNING PROBLEMS"

DEPARTMENT OF DEFENSE COMMENTS

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FINDINGS

- o **FINDING A: Status Of The B-2 Program.** The GAO reported that, in April 1990, the Secretary of Defense revised the B-2 procurement program, reducing the planned buy from 132 to 75 operational aircraft. The GAO reported that, in addition, aircraft procurement and delivery dates have been delayed. According to the GAO, the reduction in the number of aircraft to be procured is expected to lower overall logistics costs from about \$45 billion to about \$30 billion over 20 years. In response to the delivery and other program changes, the GAO reported that logistics managers have reduced the size of some facilities, canceled spares orders, and obtained equipment from bases being closed. The GAO concluded that the described actions could result in additional savings totaling millions of dollars. (p. 2/GAO Draft Report Summary)

DoD Response: Concur

- o **FINDING B: Reasonableness Of Estimated B-2 Operation And Maintenance Costs.** The GAO reported that the Air Force estimates providing logistics support for the B-2 will cost about \$30 billion over the first 20 years, including about \$9 billion for initial logistics to support 75 B-2s, and an additional \$21 billion in operating and maintenance costs. According to the GAO, the Strategic Air Command projects the B-2 will cost more per flying hour to operate and maintain than either the B-1B and B-52H. The GAO found, however, that the deployment concept provides for fewer B-2 flying hours, which will make the per squadron cost about the same. The GAO reported that each B-2 is, therefore, expected to cost \$7.7 million annually to operate and maintain, compared to \$6.9 million for each B-52H and \$7.6 million for each B-1B.

The GAO observed that the cost to operate and maintain a weapon system is based on achieving reliability requirements. The GAO concluded, however, that the predicted reliability for the B-2 appears optimistic,

See comment 3.

See comment 3.

because it exceeds Air Force requirements and the levels experienced for the B-52H and the B-1B. The GAO also pointed out that the B-2 is expected to require precise maintenance of its low observable characteristics, which is not required for the other two aircraft.

The GAO reported that the Air Force believes the B-2 reliability and maintainability predictions are not unreasonable, considering the intense development testing and the environmental test screening performed on individual aircraft components. The GAO observed, however, that if the predicted levels are not achieved, increased quantities of spares, additional test equipment, and a need for more highly trained personnel could cause overall operating and maintenance costs to be higher than Air Force estimates. The GAO pointed out that problems--such as those encountered with cracking in the rear deck during flight testing, the complexities associated with maintaining the B-2 radar cross section, and the complexity and diversity of computer software--may also make it difficult to achieve the Air Force cost estimate. The GAO concluded, therefore, that operating and maintaining the B-2 may be more costly than the Air Force estimates. (pp. 4-5/GAO Draft Report Summary)

DoD Response: Partially concur. The DoD concurs that the Air Force predictions of B-2 reliability and maintainability costs are not unreasonable. The DoD does not, however, concur with the GAO conclusion that operating and maintaining the B-2 may be more costly than the Air Force estimates. That conclusion is based on GAO skepticism that predicted levels of reliability and maintainability will be achieved.

The GAO has only identified several potential problems and observed that the Air Force expects to exceed reliability and maintainability levels achieved on the B-52 and B-1B bombers. In fact, discovery and analysis of the problems during Full-Scale Development has led to proposed solutions, and should help ensure that the cost estimates projected by the Air Force are achieved.

- o **FINDING C: Need To Synchronize Construction Projects With The B-2 Program.** The GAO reported that military construction projects at Whiteman Air Force Base totaled \$89 million in FY 1988 and \$60 million in FY 1989. The GAO found the construction that began in February 1988 was based on outdated plans. The GAO pointed out Air Force policy requires that logistics plans be updated as major program changes occur. The GAO found, however, that although B-2 delivery schedules slipped, the Air Force could not always adjust approved construction plans. According to the GAO, some of the construction projects at Whiteman occurred

3 to 4 years before required, resulting in facilities (such as the combat crew training squadron and field training detachment building) not being used or used only on a limited basis. The GAO also found that another \$500,000 was spent unnecessarily for a B-2 engine test facility. The GAO concluded that the Air Force needs to synchronize construction projects with a changing B-2 program. (p. 5/GAO Draft Report Summary)

DoD Response: Non Concur. The GAO is incorrect that the construction at Whiteman Air Force Base, which began in February 1988, was based on outdated plans. Construction start was based on plans that were valid at the time the decision was made. Although some facilities were delivered earlier than needed due to changes in aircraft delivery schedules, the difficulties in adjusting military construction project requirements are largely due to the length of the programming cycle for military construction, the two-year congressional authorization and appropriation by individual project, and the cost variation thresholds. In spite of the limited flexibility within the military construction program, the Air Force exercised prudent judgement to develop and adjust the facility acquisition schedule.

The construction program is adjusted just prior to each budget submission to meet the current delivery schedule and facility "need" dates. Additionally, since FY 1989, congressional reductions in the B-2 military construction program budget requests have been unspecified general reductions. Consequently, the Air Force used that flexibility to its advantage by deferring projects whose "need" dates were slipping. Some projects under construction were completed with the knowledge that they would be delivered earlier than needed. The Air Force determined, however, that alternative was more economical than it would have been to negotiate termination of the projects.

The GAO analysis also did not consider the inherent difficulties associated with a \$600 to \$700 million construction program at a single location. The amount of construction at one location in any one year is physically limited, and projects need to be phased such that some activities must be completed before others are started. To satisfy the engineering requirements necessary to integrate all construction, some individual facilities might be completed before need dates. Furthermore, at some locations such as Whiteman Air Force Base, there are a limited number of contractors available to do the work. Those factors impact not only the market conditions, but also the amount of work which can be completed during the

Now on p. 4.

See comment 1.

construction season and must be factored into the planning process.

Need dates for facilities are not necessarily tied to aircraft deliveries. For example, contracts to meet communications requirements at Whiteman Air Force Base were awarded to meet a need date driven by telephone requirements and not aircraft deliveries. In addition, the contract contained options to expand at a later date. In many cases, the Air Force successfully executed that type of intricate planning to ensure projects were completed at the right time.

The report gives the impression that in-process projects can easily be, and should be, replanned from one year to a future year. The GAO did not consider the cost impacts and practical construction considerations. The DoD particularly is concerned that, although the classified body of the draft report acknowledges that a \$500,000 engine test facility no longer needed for the B-2 was to be used for the A-10 (thus resulting in no net loss to the Air Force or the taxpayer), this fact is not reflected in the unclassified Executive Summary. Instead, the report summary implies that funds were needlessly wasted. That is not the case. The engine facility need date is based on engine deliveries, not aircraft deliveries. Consequently, when the contract was awarded for construction of the test cell, it was fully supported by the then current need date. When plans later changed, the Air Force acted to identify valid uses for the facility. The facility will now be used for A-10 (a base realignment and closure requirement) and T-38 (B-2 companion trainer) engine maintenance.

Many factors affect the execution of construction projects, such as the time of year for contract award, local bidding conditions, weather, equipment deliveries and installations, and the size of the annual program. The GAO did not give consideration to those factors. The overall level of efficiency speaks well for the Air Force construction planning for the B-2 program, despite the many program changes, including changes directed by the Congress.

- o **FINDING D: Personnel Assignment Plans Are Based On Current Needs.** The GAO found that Air Force managers responded to B-2 delivery schedule slippage by changing personnel assignment plans. As an example, the GAO reported that the original staffing plan provided for 1,248 B-2 personnel at Whiteman Air Force Base in FY 1991. The GAO found, however, that the plan was revised to 136 personnel for that period of time. The GAO concluded, therefore, that the Air Force

Appendix I
Comments from the Department of Defense

Now on p. 4.

tried to ensure that personnel levels were based on current needs. (p. 5/GAO Draft Report Summary)

DoD Response: Concur

The following are GAO's comments on the Department of Defense's letter dated September 23, 1991.

GAO Comments

1. In a draft of this report, GAO recommended that the Secretary of the Air Force develop procedures to ensure that logistics and construction plans are updated as major program changes occur. That recommendation has been deleted from the report. After considering the Department of Defense's (DOD) comments, GAO clarified its report to recognize that premature completion of many projects was unavoidable and to identify contractual obligations and other factors that caused some facilities to be completed before need dates. Nevertheless, GAO believes DOD should continue to be very cautious in initiating construction projects when major weapon programs are undergoing changes.

2. After considering DOD's comments, GAO clarified its report to show that solutions to development problems cause design changes that can result in multiple configurations, revised logistics plans, and higher costs. GAO's report also shows that the Air Force has a history of reliability problems and higher than predicted logistics costs on other weapon systems. If precise maintenance for low observables is required, costs may increase. The increased emphasis on using the B-2 in a conventional role also indicates that the Air Force may have difficulty achieving its cost estimate. Accordingly, GAO has not changed its finding that the Air Force's logistics cost estimates for the B-2 may be optimistic.

3. In a draft of this report, overall logistics costs for 75 aircraft were stated at about \$30 billion over 20 years. That estimate included escalation rates that were higher than rates currently being used to develop cost estimates. Using the escalation rates currently prescribed by DOD, GAO revised the estimated logistics costs for the B-2 to about \$28 billion over 20 years.